

Beam Time Structure Options for the Linac Proton Driver

Bill Foster

1. Standard 53 MHz Bunches from MI

- Beam Energy 40~120 GeV
- Beam Power 2 MW in all operating modes
- 1.5×10^{14} /cycle (25 uC) at 1.5 Hz
- Single-turn or Slow Spill
 - * MI losses may be limit for resonant extraction
- 19 ns bunch spacing
- Bunch Lengths 2-10 ns possible
- No “booster batch structure” for linac
- 700ns Abort gap every 11usec

Direct Beam From Linac

- Either H- or Protons
- Bunch frequency 325 MHz (TESLA/4)
- Bunch Length ~ 100 psec RMS
- $8 \text{ GeV} \times 25 \mu\text{C} = 200 \text{ kJ}$ per pulse
- Baseline: $2.5 \text{ Hz} \times 200 \text{ kJ} = 0.5 \text{ MW}$
 - Baseline is for comparison with 0.5 MW Synchrotron
- Upgrade: $10 \text{ Hz} \times 200 \text{ kJ} = 2 \text{ MW}$
 - May proceed directly to 2MW upgrade
depending on \$ and interest (use unspent contingency)
- Pulsewidth is 3 msec @0.5 MW, 1 msec @2MW

Using Recycler as 8 GeV Stretcher/Compressor Ring

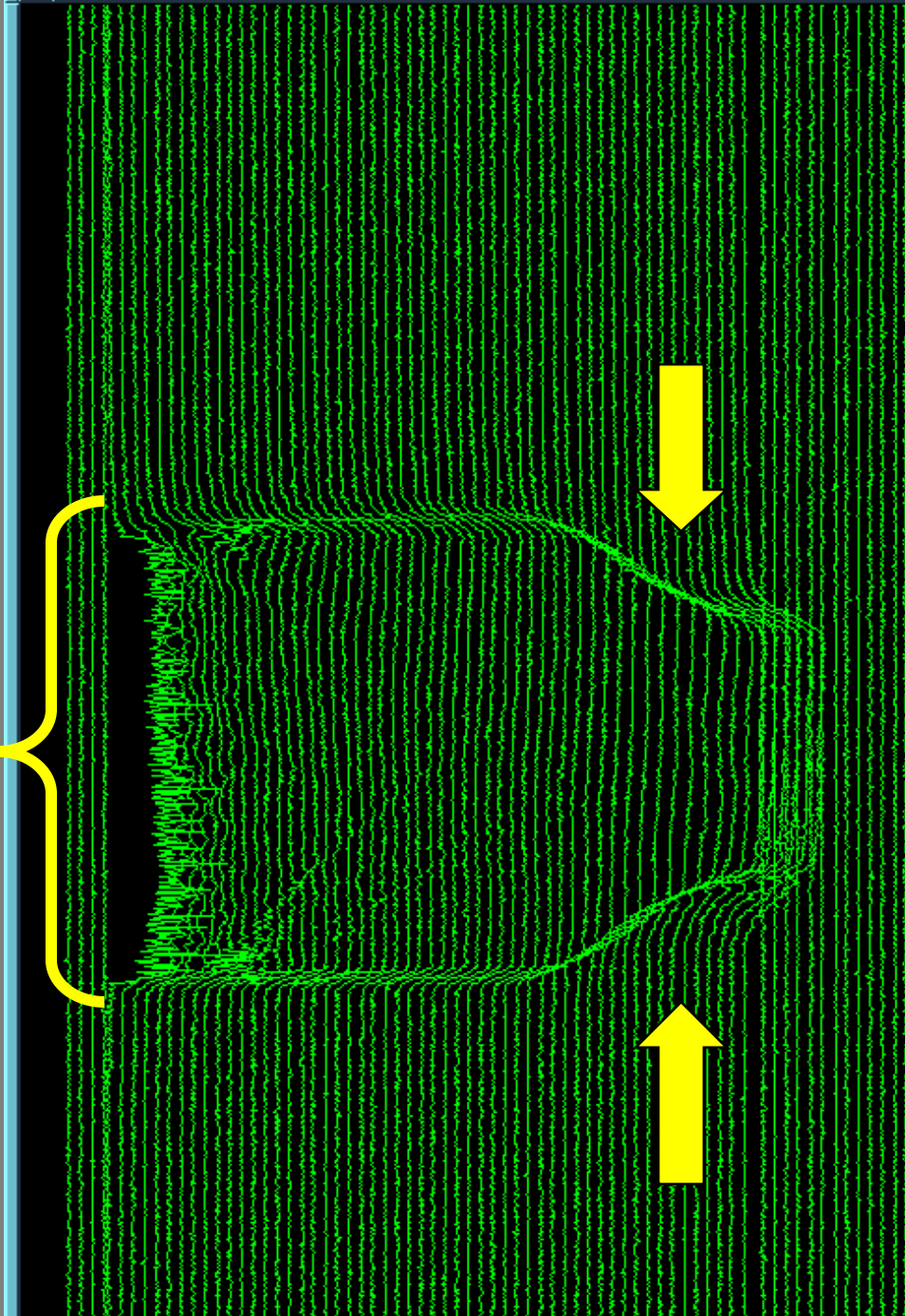
- Possible when Collider program is off
- Stretcher Ring Scenario:
 - Fill Recycler from Linac at 0.1-10 Hz
 - Continuous resonant extraction between fills
 - Average Power 200 kW – 2 MW
- Compressor Ring Scenario
 - Inject beam at 0.1-10 Hz
 - RF Compression from 11usec to 1-2usec before extraction?

Batch Shrinking Test in Recycler

Injected
Batch
From
Main
Injector

Half-Length
Batch
Extracted
Back to
Main
Injector

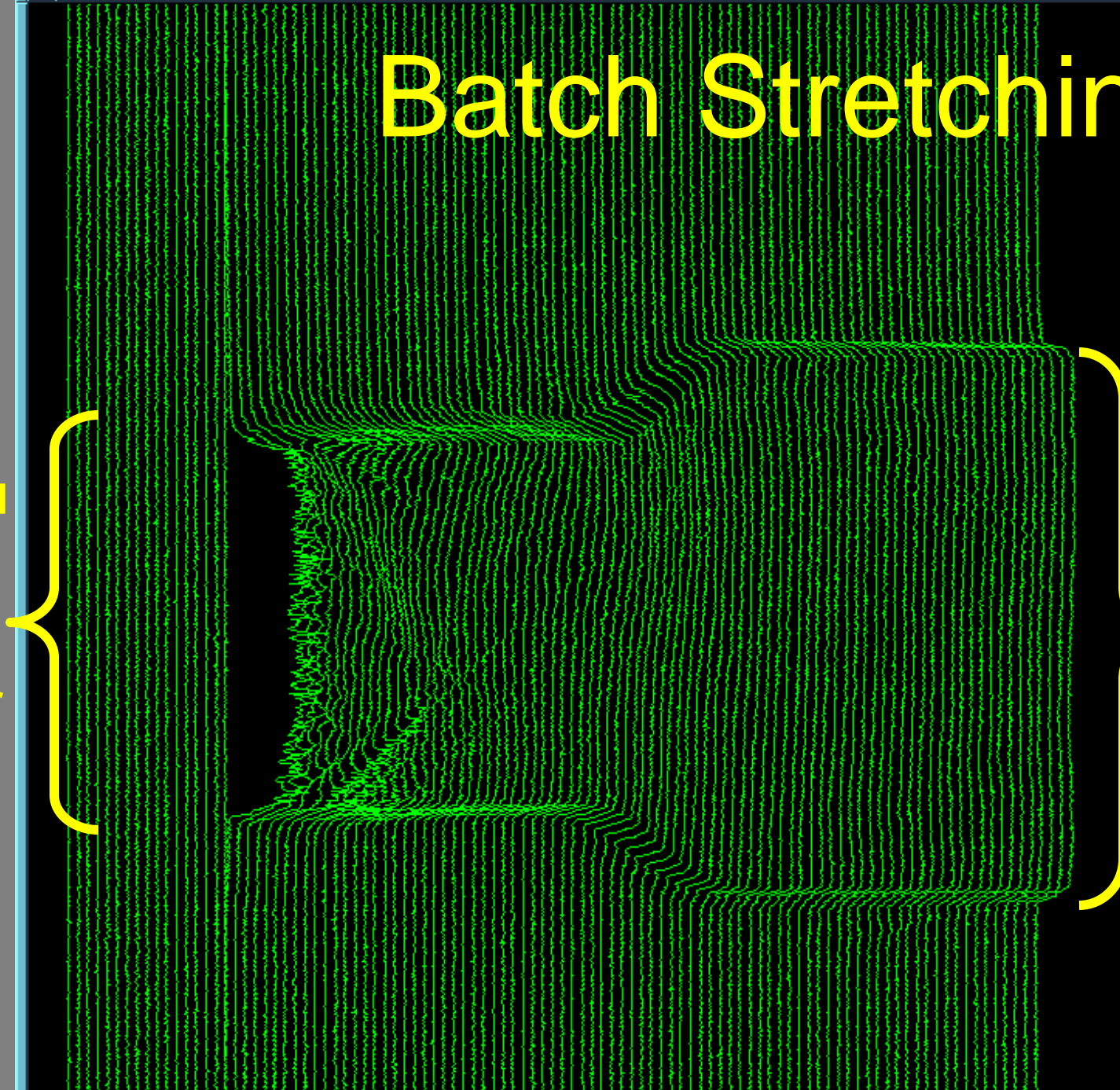
10 msec / trace



Batch Stretching

Injected
Batch
From
Main
Injector

Stretched
Batch

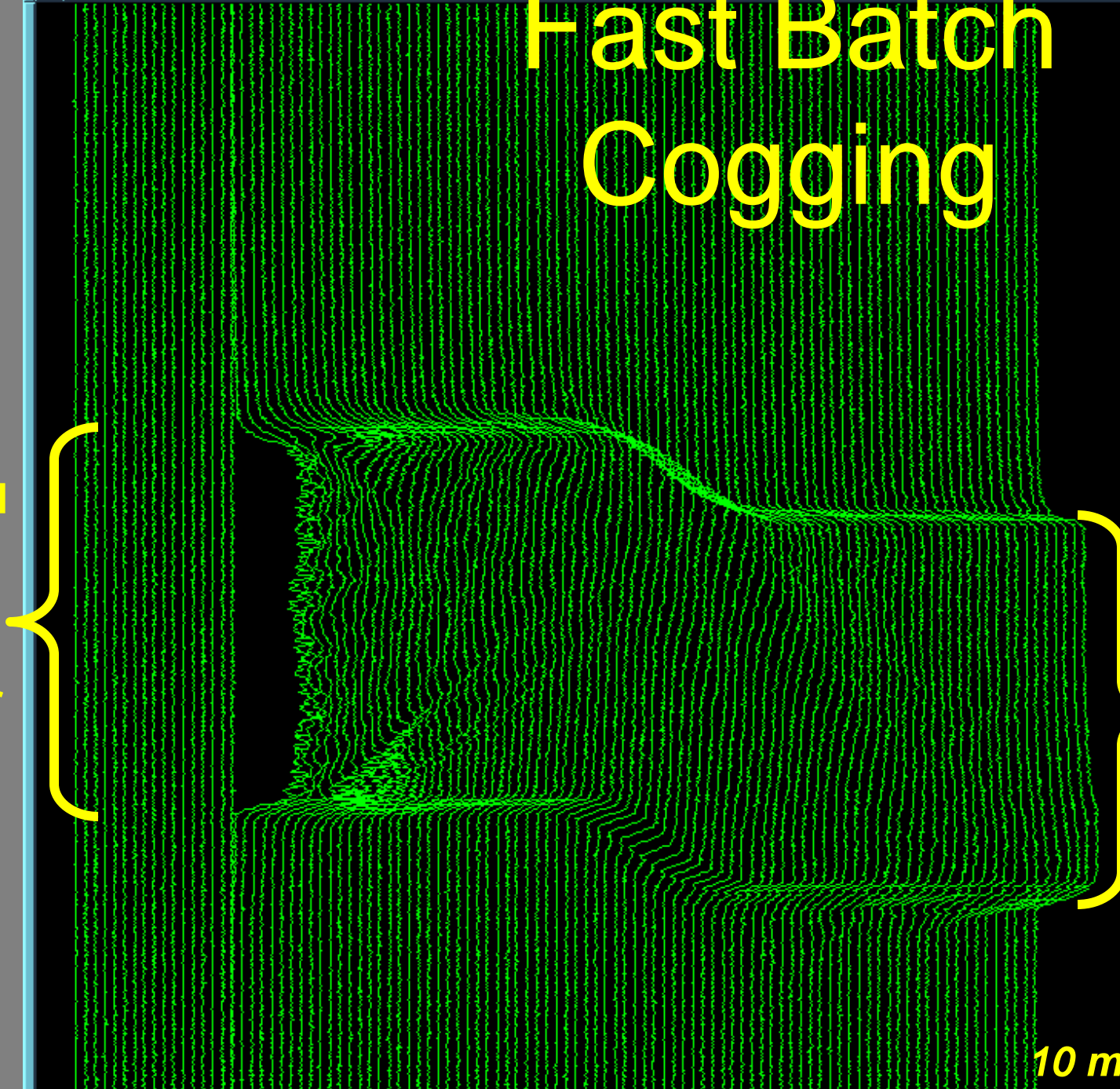


Fast Batch Cogging

Injected
Batch
From
Main
Injector

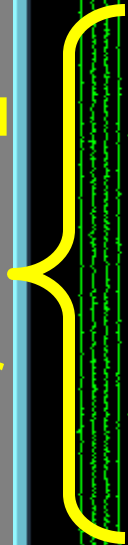
Cogged
Batch

10 msec / trace



Asymmetric Batch Compression

Injected
Batch
From
Main
Injector



*Needs
some
tuneup...*